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SUBSTANTIVE THEME: WAYS AND MEANS OF ENSURING THE PARTICIPATION OF DEVELOPING COUNTRIES IN INTERNATIONAL COOPERATION FOR RESEARCH ON AND DEVELOPMENT OF ENVIRONMENTALLY SOUND TECHNOLOGIES, AND THE RAPID AND EFFECTIVE TRANSFER OF SUCH TECHNOLOGIES TO THE DEVELOPING COUNTRIES

Report of the Secretary-General

SUMMARY

The report stresses the role of technologies with regard to global environmental concerns. It supports a concept of environmentally sound technology as an integral part of a national policy for sustainable development.

The global dimension of current environmental challenges calls for concerted action. Industrialized and developing countries must agree on a means of fair cooperation to address the growing environmental crisis. International conventions on global environmental concerns are needed which reflect the involvement of developing countries as true partners in the major efforts required. The final implementation of the goals and targets of such conventions require the application of environmentally sound technologies, which are available in many areas but often not easily accessible to developing countries. As many technologies are costly, the demand arises for international cooperation to ensure that environmentally sound technologies will be accessible to developing countries, expeditiously, and on a fair and favourable basis.

* A/CN.11/1991/1.

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The needed assistance of industrialized countries and international organizations should be supplemented by efforts to enhance the endogenous capacities of developing countries in science and technology, by means that include different forms of research, as well as partnerships between public and private entities in industrialized and developing countries. This involves guidance in the capacity to make informed choices based on technology assessment, to apply and manage technologies, and to generate home-grown research and development capabilities.

CONTENTS

	Paragraphs	Page
INTRODUCTION	1 - 8	4
I. CURRENT STATUS	9 - 43	5
A. Global environmental concerns	9 - 14	5
B. International conventions	15 - 24	6
C. Endogenous capacity-building	25 - 33	8
D. Barriers to the transfer of technology	34 - 43	9
II. WAYS AND MEANS FOR PROMOTING INTERNATIONAL COOPERATION	44 - 74	11
A. Transfer of environmentally sound technologies to developing countries	46 - 50	11
B. Funding mechanisms	51 - 64	12
C. Partnerships in research and development	65 - 74	14
III. POLICY ISSUES AND OPTIONS	75 - 106	16
Annex. BACKGROUND		22

INTRODUCTION

1. At its tenth session in 1989, the Intergovernmental Committee on Science and Technology for Development decided to select for its eleventh session the substantive theme "Ways and means of ensuring the participation of developing countries in international cooperation for research on and development of environmentally sound technologies, and the rapid and effective transfer of such technologies to the developing countries". The Centre for Science and Technology for Development was requested to prepare a comprehensive and analytical report on the subject, in consultation with other United Nations bodies and international organs. The General Assembly, by resolution 44/14, endorsed the conclusions of the Intergovernmental Committee.

2. The concept of environmentally sound technology implies a new evaluation of the relationship between people and nature: a moving away from the domination of nature to working with nature, and reassessing the methods used for the transformation of natural resources into useful products. This calls for a combination of effective action regarding environment and development, taking into account the different relationships between social, economic, technological and environmental conditions and requirements at the national and international levels. The Declaration on International Economic Cooperation, in particular the Revitalization of Economic Growth and Development in Developing Countries, adopted by the General Assembly in its resolution S-18/3 of 1 May 1990, stresses, inter alia, the relationships between (a) poverty, demographic pressures, unsustainable production and consumption patterns and environmental degradation; (b) external indebtedness of developing countries and the phenomenon of net transfer of resources from developing to developed countries, and their ability to contribute fully and in accordance with their capacities and responsibilities to global efforts to preserve the environment; (c) international economic climate, including the need to reverse the terms of trade when those are unfavourable to developing countries, and the degradation of the environment; and (d) environment, development and market mechanisms.

3. However, the efforts of developing countries in the areas of family planning and mitigation of poverty are not likely to have any great effect in the near future. As developing countries struggle to meet the current needs and aspirations of their growing populations while facing the challenge to contribute to the preservation of the local and global environment, the development, transfer, application and management of environmentally sound technologies is playing an increasingly important role.

4. Environmentally sound technology is a relative concept in that it depends on the level of information and knowledge available and the perception among the different parties in a society participating in the development process (stakeholders). This implies the following: (a) that what might be perceived as environmentally sound today need not necessarily be sound tomorrow; and (b) that any technology must be viewed in relation to the socio-economic and cultural conditions in which it is operating, thereby creating an interaction whose outcome needs to be constantly assessed.

5. Technologies that can slow down or even reverse the trend of environmental degradation in the atmosphere, biosphere and geosphere without reducing or delaying economic growth are available in many areas. Advances in biotechnologies can benefit developing countries, particularly in the areas of food and agriculture as well as human and animal health care. Environmentally sound energy technologies are on the market which can be applied to meet growing energy needs, including those of rural areas. Progress has been made in the development of technological alternatives to chlorofluorocarbon-based technologies.

6. Nevertheless, the availability of environmentally sound technologies on the market is only one side of the coin. Developing countries may face serious problems in their ability to afford them. As such technologies are central to sustainable development, it is incumbent on the international community to find ways and means to promote the transfer of environmentally sound technologies to developing countries, including financial assistance to developing countries from funds additional to current flows.

7. Emphasis should be given to the fact that the generation of home-grown technologies, as well as the adaptation, application and proper management of transferred technologies, would require a "critical mass" of endogenous capacity in science and technology, including a minimum of research and technology assessment capabilities.

8. Consequently, in addressing the areas of principal action to be taken by the 1992 United Nations Conference on Environment and Development, the report of the Secretary-General of the Conference to its Preparatory Committee stressed, inter alia, the following: "Technology, particularly the need to make the most environmentally sound technologies universally available, is a major element in respect of many areas requiring action. Of special importance are measures required to make such technologies and the capacities to develop and apply them available to developing countries under conditions that are fair and affordable" (A/CONF.151/PC/5, para. 28 (e)).

I. CURRENT STATUS

A. Global environmental concerns

9. The world may be moving towards an environmental crisis that will seriously affect the development prospects of all countries. Climate change and global warming, depletion of the ozone layer and the loss of biodiversity have a particular effect on sustainable development resulting from the fact that (a) the damage that is being done to the environment is partly non-reversible; (b) major activities related to these issues in one country could affect the majority of all nations; (c) some of the remedies must be taken on a global scale; and (d) transfer of resources, financial and otherwise, to developing countries is essential to reach meaningful solutions.

10. Industrialized countries consume a disproportionate share of the world's natural resources and are responsible for generating the greatest volume of waste and emissions. Significant improvements in the global environmental situation

require radical changes in the production and consumption patterns of industrialized countries.

11. Nevertheless, in developing countries overexploitation of marginal lands, massive deforestation for farming, mining, lumber and fuel wood - often a result of the combination of poverty and population growth - as well as the application of environmentally "unsound" technologies and methods of cultivation, have also begun to affect the environment.

12. Deforestation accelerates land degradation processes and contributes to a diminishing of the natural cycle of carbon dioxide absorption. Rice paddies and domestic cattle, the basis of the food supply of more than 2 billion people in developing countries, are major sources of methane, another greenhouse gas. Extensive use of fertilizers and pesticides has negative consequences, not only for land and water resources but also for the health of farmers.

13. In addition to these developments, industrialization and urbanization in some developing countries are increasing the pressure on the natural resource base. Although developing countries as a whole are responsible for less than one quarter of all fossil-fuel-based carbon dioxide emissions, the demands of development, coupled with population growth and urban migration, have already increased the rate of growth of energy consumption in developing countries to levels higher than that in industrialized countries.

14. The environmental challenge requires an increased solidarity among all nations and the political will of all countries to search for a concept of sustainable development guided by the phrase "think globally, act locally".

B. International conventions

15. The global dimension of current environmental challenges calls for concerted action. International conventions on global environmental concerns are required which reflect the involvement of developing countries as true partners in the required major global efforts, and their cooperation in signing, ratifying and adhering to such conventions must be ensured.

16. The United Nations Conference on Environment and Development will reflect important progress that has been made at the international level to give effect to the concept of environmentally sound and sustainable development as it was articulated in the Report of the World Commission on Environment and Development: Our Common Future (the "Brundtland report"). 1/

17. Resolution 45/212 adopted by the General Assembly which, inter alia, refers to the work of the Intergovernmental Panel on Climate Change and the results achieved at international meetings on the subject, including the Second World Climate Conference, could be a starting point towards the negotiations leading to a framework convention on climate change. Such a convention would be drawn up in protocols and action plans containing mechanisms to implement specific targets and goals directed towards reducing emissions of carbon dioxide and other greenhouse gases.

18. A landmark agreement was reached through the adoption of the Montreal Protocol on Substances that Deplete the Ozone Layer. 2/ An Interim Multilateral Fund was established in 1990 for a period of three years, to assist developing countries in financing the incremental costs they will incur in complying with their obligations under the Protocol. The Fund will be additional to existing aid flows to developing countries. The assets of the Fund currently stand at $160 million, which soon will be increased to $240 million as additional developing countries sign the Protocol. 3/ This has been connected with the agreement on a mechanism to facilitate the transfer of non-chlorofluorocarbon-based technologies which are needed to halt further global damage and reverse the damage already caused to the ozone layer.

19. Based on the work of the Ad Hoc Working Group of Legal and Technical Experts on Biological Diversity which has been established to negotiate a Global Framework Convention on Biological Diversity, a Draft Convention on Biological Diversity has been prepared. Consultations have emphasized that the protection of the biosphere, especially in relation to biological diversity in the context of representative ecosystems, should be strongly related to the need of improving the social and economic situation of populations living in those ecosystems.

20. Climate change, ozone layer depletion and loss of biological diversity are global environmental issues that have a strong technological relevance. They are in the forefront of international deliberations preceding the 1992 United Nations Conference on Environment and Development. Without underestimating environmental concerns of a more local or regional character, and without denying their relevance to the overall environmental problem, there is some evidence that those concerns can be negotiated within action plans that could be identified as operational elements of global conventions and be implemented mainly on the basis of bilateral or regional projects and programmes.

21. International conventions and other legally binding agreements on global environmental concerns mostly identify goals. The question is how to achieve the particular targets within a certain time-frame. The answer is directly related to the responsibilities of countries in terms of their share in the degradation of the global environment as well as their capacity to engage actively in the process of implementing such international agreements.

22. Although negotiations on international conventions should be guided by the common responsibility of all countries, actions on the basis of an "equal percentage" strategy would not reflect the lower contribution of developing countries to global environmental degradation both in the past and in the present. Moreover, a uniform regulation of this type would be unrealistic in view of the very limited capacity of the majority of developing countries to allocate resources for preserving the global environment.

23. The industrialized countries possess the technologies as well as the financial and institutional means to monitor and mitigate environmental damage. They virtually dominate research and development of environmentally sound technologies; they also, in principle, control the transfer of such technologies to developing countries. Furthermore, the industrialized countries have the capacity to make

best use of those technologies according to their different needs. In contrast, developing countries are disadvantaged in most of the above-mentioned aspects.

24. Thus, targets for developing countries must be formulated on realistic terms of responsibility, affordability and capacity, thereby enabling developing countries to react to global environmental challenges without sacrificing their legitimate rights to economic growth.

C. Endogenous capacity-building

25. Given that the creation of national conditions for applying and managing of environmentally sound technologies in the productive sector is crucial to the efficient use of such technologies, special attention must be paid to building up endogenous capacity in science and technology. A "critical mass" of endogenous capacity is also a necessary prerequisite for generating home-grown technologies and increasing the share of developing countries in international cooperation for research and development of environmentally sound technologies.

26. The end-of-decade review of the implementation of the Vienna Programme of Action, conducted by the Intergovernmental Committee at its tenth session (A/CN.11/89), showed that:

(a) The building of endogenous capacity has yet to take deep roots in most developing countries;

(b) Future emphasis on the development of policies, infrastructures and human resources should be less on quantity and prestige but more on quality and socio-economic purpose with longer-term orientation;

(c) Drastic revision of current approaches to technical cooperation is needed with emphasis on well-conceived areas of priority attention evolved through national policy dialogues among stakeholders in the development process.

27. The efforts for building up endogenous capacities in science and technology over time, have led, in many developing countries to the creation of institutional structures for technology assessment, research and development, as well as for technological services. However, for a variety of reasons, the scientific and technological infrastructure and capabilities thus created have, in many cases, failed to fulfil their potential. This is partly due to the lack of necessary links (a) among the different elements of the scientific-technological infrastructure; (b) with the transfer of technology from abroad; and (c) with the national productive sector and its technology needs.

28. The efficiency of applied technologies depends, first and foremost, on the capacity to make appropriate choices based on technology assessment. This presupposes institutionalization of technology assessment and its networking with research institutions, technology centres and the productive sector. It also requires the elaboration of a methodology for technology assessment stressing the approach that technology is the connecting link in what might be called the

"technology-environment-development triangle". Such an approach should, however, be considered as a general guideline which may be specified on a country-by-country basis.

29. A necessary prerequisite for technology assessment to generate meaningful recommendations for technology choices is the availability of a reliable database as a source of information on available technologies, terms of transfer and ownership. Such a database is often not available in or accessible for developing countries.

30. Although reliable statistical data on research and development of environmentally sound technologies is not readily available, one can assume that the share of developing countries' investments in research on and development of environmentally sound technologies compared to industrialized countries is very small.

31. In global terms, the share of developing countries as a whole accounted for only 6 per cent of overall expenditures in research and development, of which around 80 per cent is undertaken in only about 20 countries. Most developing countries have been unable to mobilize even 0.5 per cent of their GNP towards research and development, in comparison to over 2.5 per cent in many industrialized countries.

32. With respect to human resources in developing countries, the density "index" for scientists and engineers engaged in research and development for every million inhabitants is estimated at 127 (49 in the case of Africa, excluding Arab countries) as against roughly 3,000 for the industrialized countries.

33. The gap between industrialized and developing countries in respect of technology generation, and the capacity to apply and properly manage technologies will likely increase because of the nature of environmentally sound technologies, which are mainly knowledge-intensive. They are characterized by a high degree of interdisciplinary scientific content and research intensity, high expenditure (both for research and production), intersectoral influences and a capability for horizontal diffusion, and rapid change and obsolescence.

D. Barriers to the transfer of technology

34. Environmentally sound technologies are available in many areas but not easily accessible to developing countries who often lack the financial means to cover, for instance, the demanding patent and licensing requirements. There are numerous other barriers which restrict the flow and increased use of environmentally sound technologies in developing countries.

35. An ongoing research study by the United Nations Centre on Transnational Corporations, on the transfer of environmentally sound technologies to developing countries under favourable terms, contains a provisional list of some of the barriers. The study divides the barriers into categories by actors. Each list then covers real or perceived barriers from the perspective of transnational corporations or developing countries.

36. Barriers from the perspective of transnational corporations, include:

(a) Reduced expectations of profits from sales of environmentally sound technologies due to lack of markets, legal requirements or market information;

(b) Difficulties in implementing high capital-intensive environmental protection technologies due to lack of adequate technical and/or social infrastructure;

(c) Unfair competition due to lack of comparable environmental regulations and standards in developing countries or internationally.

37. Barriers from the perspective of developing countries are:

(a) Patent holders prevent environmentally sound technologies from being used in developing countries by refusing to license the technologies or by setting costs too high;

(b) Developing countries are discouraged from using environmentally sound technologies because "polluting" technologies have a price advantage, current financial resources are insufficient to cover incremental costs and there are no new financial resources available specifically for environmentally sound technologies;

(c) Developing countries lack "eco-incentives" owing to limited information on local environmental problems and the existence of more pressing local priorities.

38. Most of the barriers listed are related to international trade and legal issues but they also emphasize the infrastructural changes necessary within developing countries for the successful transfer, maintenance and mastery of environmentally sound technologies. These changes, such as enhance local training, education, and research and development institutions in developing countries will require as much additional funding as the actual transfer of the technologies.

39. Given the current debt problems faced by developing countries, it is doubtful that those countries will be able to afford the costs normally incurred in transferring environmentally sound technologies, or accomplish the internal changes necessary for applying and managing those technologies, without the generation of additional external financial resources.

40. The relevance of intellectual property rights as legal instruments has been widely acknowledged for technology transfer and generation. National patent systems are key factors in protecting inventions. They significantly affect the transfer and application of environmentally sound technologies, many of which are new solutions to technical problems and industrial design.

41. In the international arena the Convention for the Protection of Intellectual Property, known as the Paris Convention, is strongly debated. Some developing countries contend that the Paris Convention favours the technologically advanced industrialized partners which, in principle, define the terms for transfer of patent rights, licensing and know-how agreements.

42. The requirement of "absolute novelty" in the granting of patents favours those cutting-edge and high-technologies that are usually produced in the industrialized countries. This has given the existing patent system a "high-tech bias". Simpler inventions - which could be the domain of developing countries - are further discouraged by the requirements of "inventive step" and "non-obviousness". The connection of patent protection with these strict requirements is seen as a discouragement of incremental technological changes that evolve organically out of the existing technological level.

43. Some developing countries have argued that the international patent system lacks transparency. Thus, it might be difficult, in particular for developing countries, to access typical patent information such as the state-of-the-art of a certain technology, detailed description of inventions, ownership or terms of transfer. To assist in more transparency, the World Intellectual Property Organization has created a State-of-the-Art Search Programme to provide, free of charge, institutions and individuals in developing countries with this type of information.

II. WAYS AND MEANS FOR PROMOTING INTERNATIONAL COOPERATION

44. The need for additional resources to implement the concept of sustainable development in developing countries calls for strong and continued assistance by industrialized countries and international organizations. Such assistance may support an increase in the local capability to make reasonable technology choices based on technology assessment and to generate home-grown research and development capabilities.

45. Technology transfer and endogenous capacity-building, including cooperation in research and development, are areas where the international community can contribute to promoting the concept of environmentally sound technology in developing countries. These areas are closely interrelated. In order to be successful in technology transfer, the conditions that (a) permit a recipient nation to make appropriate choices based on the assessment of available technology, (b) ensure the access to and affordability of environmentally sound technology, and (c) enable the recipient country to manage the technology and its future development, must be adequately addressed.

A. Transfer of environmentally sound technologies to developing countries

46. Proprietary technology is mostly in the hands of private entities. Therefore, technology transfer in the area of environmentally sound technology requires the application of mechanisms which permit publicly-funded intermediary institutions to purchase licences from private owners on a selective basis and make them available (with relevant support services) to public and private institutions in developing countries. The criterion for free licensing to the institutions should be the level of environmental benefit provided as compared with alternatives.

47. Proprietary technology exists in some areas which is often no longer used in the developed world but which could provide substantial environmental benefits for developing countries. By way of example, coal-burning technology for residential heating, which has been out of use in most developed countries, but could be applied for a certain period of time in developing countries with abundant coal supplies. There is a need to identify such technologies and to provide incentives for their marketing and further development through partnerships between the owner of the technology and the potential user in developing countries. Intermediary institutions mentioned above could serve as broker for this purpose.

48. Global environmental investment in developing countries may often produce greater overall benefits for the environment than investment within industrialized countries themselves. For example, some industrialized countries have financed programmes for tree planting in developing countries to compensate for the gases emitted by industrial plants in those industrialized countries. There should also be a focus on energy savings where the growth of consumption is highest and the efficiency of energy production is lowest. This consideration may lead to a special effort to bring clean technologies to developing countries in preference to sometimes more expensive marginal technological improvements in industrialized countries themselves.

49. Methods should be sought to stimulate investment by industrialized countries in cleaner technologies and more efficient energy generation and use in developing countries. For example, in areas of the world where carbon taxes have been established, such taxes should be used primarily to invest in the best carbon dioxide reduction projects on a global scale. A system of "carbon dioxide reduction credit" could be considered to encourage measures in this direction.

50. Much of the international discussion focuses on proprietary and commercialized technologies. But it should not be overlooked that although a large percentage of environmentally sound technologies are in the public domain, developing countries still face difficulties in gaining access to proprietary technologies. In this context, special attention should be paid to the transfer of technologies that are financed on a public basis or financed through mechanisms under public control. This applies to all technologies financed under terms of bilateral and multilateral development cooperation.

B. Funding mechanisms

51. Estimates have been made of the magnitude of the overall costs involved and the costs for developing countries to comply with the goals and targets of international agreements on global environmental issues. The World Resources Institute estimates that $26 to 65 billion would be needed to counteract the greenhouse effect. Another $2 to 7 billion would be required for the overall implementation of the goals and targets of the Montreal Protocol. 4/

52. According to an estimate published in a study by the United Nations Environment Programme, developing countries would need $1.8 billion over the next eight years to substitute the use of chlorofluorocarbons in industry by less polluting alternatives. 5/

53. The overall financial needs for biological diversity have been notoriously difficult to evaluate. The cost of conservation has been estimated by the United Nations Development Programme and the World Resources Institute in their report on the International Conservation Financing Project to be roughly $20 to 50 billion a year for the next decade.

54. Although the different estimates might be considered as rough calculations, showing considerable gaps with regard to their lower and upper levels, they all reflect the tremendous magnitude of funds required. Taking into account the debt situation of developing countries in the context of their primary target, which is to meet the basic needs of their populations, it becomes obvious that the funds required to cope with global environmental problems cannot be raised through traditional development assistance, grants or donations. Additional external funds must be mobilized to bridge the gap between what is available and what is needed, and appropriate mechanisms identified to manage those funds. Moreover, the long-term nature and magnitude of the problem is such that financial resources will be needed that are not only additional but also, as far as possible, sustained, predictable and assured.

55. Particular attention should be paid to incentive-based funding schemes such as market mechanisms, tradeable permits and consumption rights, taxation mechanisms, insurance and reinsurance, and offsets. The particularly attractive aspect of those innovative mechanisms is that they generally do not involve financial outlays of public funds from industrialized countries, nor the transfer of unusually large cash flows across international boundaries. Thus, such mechanisms generate resources additional to development assistance funding.

56. The effectiveness of incentive-based approaches to environmental protection depends widely on features that generally characterize smoothly functioning markets in a climate of abundant information flows. However, they can offer several potential advantages, such as self-financing, a better reflection of true costs of economic activities to society and, above all, stimulation of the development and application of cleaner technological solutions.

57. Market mechanisms include a variety of mechanisms such as rents, royalties, greenhouse investment funds, venture capital, joint industrial projects, eco-bonds, and green labelling that stimulate the market to behave in an environmentally friendly manner.

58. Tradeable permits and consumption rights such as the proposed international tradeable carbon emission permits, could generate financing for developing countries from the trading of under-utilized rights and the penalties imposed for infringements.

59. Taxation mechanisms could be applied to stimulate market behaviour that promotes penetration of environmentally sound technologies through user and producer taxes (example, fuel taxes) environmental fines, and incentives such as tax rebates, tax reductions, tax exemptions and subsidies.

60. Insurance and reinsurance can be geared to promoting an environmentally sound approach to economic activity through the transfer of knowledge related to the minimization of risks to insurers and the insured.

61. Offsets can be effected through the large-scale purchase of goods and services, such as through government procurement, as a way of generating resources to deal with environmental issues. They provide an incentive to the owners of technology processes, cheaper financing, distributions networks, access to information, and management skills to extend or develop their assets to support the environment.

62. The establishment of multilateral funds, such as international environmental funds, as exemplified by the Global Environmental Facility of the World Bank, UNDP and UNEP, constitutes clear evidence of the political commitment to move onto the environmental agenda. Such funds can play an important role in regulating the environmental balance between nations based on criteria of equity and international justice. They can also directly contribute to transferring environmentally sound technologies to developing countries and the strengthening of endogenous capacities in those countries.

63. Recent initiatives taken by some Governments of industrialized countries to link debt reduction to sustainable development in developing countries, have led to the use of debt conversion schemes. The most widely used type has so far been the debt-for-equity swap, mainly for industrial and tourism projects, but there is much more scope for development of a variation of these techniques - the debt-for-nature or debt-for-environment swap. A wide range of projects could be financed using those techniques, ranging from conservation and sustainable development of existing natural resources (for example, wildlife parks, botanical gardens, forestry management and soil stabilization) to new projects involving the application of environmentally sound technologies (for example, waste management, halting deforestation and promoting afforestation, sustainable agricultural development, pollution control and alternative energy sources), as well as the financing of education and research centres.

64. To avoid inflationary effects through the "unplanned" release of local currency into the economy, such programmes and projects should be limited in scope and only form part of an overall "menu" of funding mechanisms. It must also be stressed that debt conversion schemes will have to include not only nature preservation but also activities that directly address society's immediate social and economic needs. Therefore, swap programmes must be implemented with the agreement and under a certain control of the Government. Moreover, the participation of a well-established and competent domestic non-governmental organization to manage the endowment and conditions of such a programme will enhance its successful implementation.

C. Partnerships in research and development

65. In order to increase the share of developing countries in international research and development of environmentally sound technologies, different forms of partnerships should be used in private and public sectors and between them. Such

partnerships would allow for better utilization of know-how and other resources existing in universities, government laboratories and public service institutions.

66. The promotion of partnerships in research and development should be geared to development rather than market strategies. This, of course, does not exclude the need to target such partnerships towards commercialization of the research results.

67. Multilateral cooperation should be encouraged because it has the advantage that international solidarity aspects come into play, bringing the weaker and poorer partner into contact with the international scientific and technological community. The growing environmental crisis, which obliges each country to enhance its capacity for generating, applying and managing technologies, demands an increase in multilateral cooperation.

68. One approach to such collaboration could take the form of a network of international research centres. Some developed and developing countries are encouraging this approach. The network would be based primarily on existing regional research, development and demonstration centres, which must be strengthened, thereby linking these regional centres to national institutions.

69. The operational agenda of the regional centres should include both region-specific problems and universal or global problems, with emphasis on technical support for regional initiatives.

70. It is important that there should be some rationale for a division of labour between different institutes in different regions and a coherent programme for the allocation of resources among them, by which the institutes present their accomplishments and plans, and donors pledge their support according to their interests and the evaluation and recommendations of a technical advisory committee.

71. As in the centres of the Consultative Group on International Agricultural Research (CGIAR), the functions should include both research and extension with particular emphasis on demonstration. The extension/demonstration function may be partly carried out through local organizations and partnerships of various kinds, paralleling the important function of national agricultural laboratories in relation to the CGIAR system.

72. The regional institutes should serve as laboratories and/or field stations, not just information centres or think tanks. In the present state of communication, information on available technologies and environmental and health data are better circulated through networks, although the institutes might also serve a secondary function as nodes in this network.

73. Ultimately, the regional institutes should aim to be staffed mainly by scientists from the region, but also incorporate international scientists in order to bring a global perspective into play and help to build endogenous capacity through close collaboration between locals and expatriates in all aspects of the operation.

74. Scientists from developing countries might gain valuable experience from participating in the design and operation of a global observation and monitoring system and in research on global environmental change, including climate change, ozone layer depletion and loss of biological diversity, and their effects on development. The involvement of developing countries' scientists in the Global Change Research Programme is an important vehicle for linking science in the developing countries with the world scientific community, thereby contributing to the building of endogenous capacities in the participating developing countries.

III. POLICY ISSUES AND OPTIONS

75. Global environmental concerns such as climate change, ozone layer depletion and loss of biological diversity require global solutions which must be negotiated collectively, but local responses may be different. Policy decision-making should bear in mind that each country must interpret its environmental concerns as part of the global environmental situation, seek national solutions with the support of international cooperation, and identify the technologies most appropriate to implement those solutions. The final objective of technology application must be to achieve a given increment of development with a minimum global adverse environmental effect.

76. In the case of ozone layer depletion, substitutes for chlorofluorocarbons will primarily be developed in developed countries. Developing countries will benefit from the application of such substitutes in refrigerators, air-conditioners and in foam expansion.

77. In the case of carbon dioxide emissions, one should aim at the largest emission reduction for a given investment, regardless of location. This may often be in developing countries where energy production and consumption are less efficient. Thus, improvement of local technologies, such as in combustion efficiency, might have higher priority than further improvements in the energy efficiency of developed countries. Attention could also be given to local possibilities such as hydroelectric power or solar energy if they promise to be economically practicable in the near term.

78. The issue of "loss of biological diversity" differs widely from both of the above-mentioned environmental issues in terms of the role of technology. In this case, there is no clearly identifiable "pollutant" such as carbon dioxide or chlorofluorocarbons. Remedial actions are much more socially based and oriented. Biotechnology can assist the conservation of genetic resources and evaluation of germ-plasm for specific traits. Further international efforts should be made to establish gene banks and to associate them, where possible, with propagation facilities in developing countries.

79. Developing countries currently meet most of their technological needs by importing technologies which have been developed to meet the demands and conditions of industrialized countries. The effects of this massive transfer of technology on developing countries are ambivalent.

80. Governmental strategies and policies for the transfer of environmentally sound technologies would have to address the issue of interfacing this transfer with domestic technological innovation processes. A shift of emphasis from costs, terms and conditions of transfer towards establishing links between research and development, institutions and the acquisition of technologies transferred from abroad, is required. In this way the two streams of technology, those transferred from abroad and those generated within the country, are made to interact at the enterprise level and thus contribute best to a country's development objectives.

81. The transfer of environmentally sound technologies to developing countries should be combined with programmes which ensure the rapid diffusion of such technologies and thus effect the environment in a reasonable length of time. Consequently, mobile demonstration units may be used, in particular in rural and remote areas, to demonstrate the benefits of using such technologies and to convince rural residents to apply them. An example in this direction would be the use of efficient wood or charcoal burning stoves.

82. It is evident that, in many cases, environmentally sound technologies will be more costly than conventional technologies. This creates a need for generating additional funds and making them available for developing countries. Taking into account that least developed countries are heavily dependent on financing of development instruments under arrangements of development cooperation - private capital flows through investments and commercial financing have become rather marginal - the transfer of technologies to those countries, including the choice of technologies, becomes very much a matter of public concern.

83. This also applies to other groups of developing countries, especially those which are heavily indebted, have difficulties in gaining access to capital markets on competitive lending terms, but also those which are very dependent on the financing of their development activities through multinational development banks. In fact, this applies very much to the majority of sub-Saharan countries. In the light of this situation, the choice between the financing of projects which, in their design, still reflect conventional technologies and those which introduce alternative environmentally sound or less harmful technologies, is very much a decision to be taken by Governments which, on one side, constitute the boards of governors and directors of multinational development banks and, on the other side, the Governments of the borrowing countries.

84. Alternative technologies are normally not yet well introduced, or even fully known. This might suggest the establishing of a clearing-house for such alternative technolcgies, and encouraging engineering consultants who play a crucial role in the preparation and the design of projects to make the optimum use of alternative technologies.

85. This, of course, will not solve the problem of additional costs that arise in appraising the financial feasibility and economic practicability under the conventional practice of cost-benefit analysis and accounting, which raises the question of who should pay for those additional costs. It is proposed that projects continue to be appraised on the normally lower basis of the conventional technology, even if the mere costly environmentally sound alternative technology is applied. With regard to the additional costs, there should be an understanding

that these costs should not be an undue burden on the recipient country. There is a need for a special mechanism which would have elements of a fund and/or of a system of most favourable lending terms to finance those costs by the borrower.

86. Industrialized and developing countries should identify and take effective measures to remove barriers to the transfer and dissemination of environmentally sound technologies. "To this end, there is a need to transfer the best available environmentally sound technologies to developing countries expeditiously on a fair and most favourable basis". 6/

87. In this regard, international legal measures affecting technology transfer from abroad should be considered. Agreements on a Code of Conduct on Transnational Corporations and a Code of Conduct on the Transfer of Technology are important goals for all countries.

88. Such regulations could be also used as a legal basis to avoid negative developments in technology transfer such as the transfer of technologies that are banned in industrialized countries because of their environmentally "unsound" effects.

89. Triggered by the debate on the shortcomings of the existing patent system several proposals have been put forward. Among them has been the concept of establishing a new patent system which runs parallel to the existing one but leaves its operations unaffected. The additional patent system would cover property rights in cases that could not meet the stringent criteria of the existing patent system, but which would be relevant, particularly for developing countries, in putting new products on the market.

90. Considerable scope exists for establishing and strengthening different forms of cooperation and partnerships in research, development and application of environmentally sound technologies, between industrialized and developing countries at bilateral and multilateral levels. Programmes and projects carried out at the multilateral level should primarily tackle global issues as well as assist developing countries to strengthen technology assessment capacities and promote education. Bilateral efforts could be devoted to enhancing the innovation and management capacities of developing countries and should support those countries in basic and advanced training of skilled workers. Both bilateral and multilateral levels should be encouraged to utilize locally available personnel, know-how, infrastructure and technology.

91. Private/private as well as public/private partnerships could be of decisive importance to the industrial development and competitiveness of developing countries. They also would contribute to strengthening the national innovation potential of participating developing countries. Particular attention should be paid to promote the development and competitiveness of small and medium-sized enterprises in developing countries. For example, transnational corporations could commission small local firms for particular contracts relevant to environmentally sound technologies.

92. In partnerships where private entities are involved it is important that any legal regulations established for such cooperation should abide by governmental obligations to follow and audit the use of public funds. It is also important that such regulations respect the nature of private business. Research and development projects are of little interest for the private partner unless exclusive rights to the results can be guaranteed.

93. The establishment of intermediary, publicly-funded, institutions to provide technology brokerage services should be encouraged. Moreover, privately-funded intermediaries may find niches as well. For example, a consortium of firms might support intermediaries to manage the licensing of technologies to small markets where it may not be worth while for one firm to negotiate and supervise separate agreements for each market. Also, transfer of information and expertise of a non-proprietary nature on environmentally sound technologies might be accomplished in this way.

94. Basic and advanced training for skilled workers holds enormous potential for research and the acquisition of technical know-how. It supports the build-up of the "critical mass" in science and technology necessary to generate, apply and adapt technologies. In partnerships where the private sector is involved, particular attention should be paid to supporting developing countries in building a stock of engineers who can serve as link between technical know-how and its incorporation into the productive process. From the point of view of development policy, training which takes place in developing countries should have priority. For Governments of developing countries it is important to create performance-related incentives for skilled workers and to improve the conditions for scientific research and technological development in their countries.

95. Collaborative activities are often substantively hampered by a lack of reliable data on ongoing efforts, their relative size, their nature and objectives, the participants and the state of implementation. Provision of an adequate data bank and access to this information in relation to programmes and projects at bilateral as well as multilateral levels should be given high attention.

96. International cooperation in research and development of environmentally sound technologies which address the global environmental challenge calls for creative measures to generate know-how and technologies at the multilateral level. In that context, the international community should explore the potential value and practicability of establishing a world-wide network of international research centres as a consultative group on international research on environmentally sound technologies. Such a network would concentrate on the technological and information demands emerging from international conventions on global environmental concerns.

97. Given the rapid pace of technological advancement and related structural change in the world economy, which significantly affects the trade and development structures and operational abilities of weak economies, it may be worth while to explore the extent to which suitable technological cooperation between developing countries could enhance structural and technological change in developing countries' economies.

98. The new development concept emphasizes participatory decision-making in all societies. Sustainability of development requires continuity and resiliency of policies. Consensus-building between Governments and the private sector and community participation at the local and national levels is needed in the decision-making process related to technology choices. Existing institutional structures should therefore be adapted as necessary to meet new and emerging requirements.

99. Governments should establish policy instruments to encourage enterprises in both the public and the private sectors to participate in integrating and adapting to global and local environmental concerns, especially if current regulations and market rules do not sufficiently consider the internalization of environmental costs. Such costs may also not be adequately included in the calculations of enterprises, partly because of lack of knowledge of the environmental effects of production processes and products and the social costs needed to clean up those effects.

100. Such instruments that Governments could consider include (a) fiscal incentives such as fees, taxation and subsidies; (b) information support, such as advertising, education and training, and notification of changes in laws and regulations; (c) research, development and demonstration assistance to establish and manage response strategies; and (d) environmental legislation for pollution control and setting of environmental standards.

101. Fiscal incentives should be designed to internalize environmental costs, thereby altering the market prices of products and equipment to fully reflect social costs of environmental pollution.

102. Information support could be used by Governments to increase the ability of decision makers at the enterprise level to make qualified technology choices, in particular with view to broader and long-term development objectives.

103. Research, development and demonstration assistance may be used by Governments to accelerate the process of technological change through the promotion of invention, innovation and diffusion. A major goal of such assistance should be to reduce risks and uncertainties to the effective application of those technologies, including the elaboration of "hedging strategies". At the invention stage, the defining of property rights and issuing of inventor's certificates are important; at the innovation and diffusion stages, market information is important.

104. Environmental regulations which have the force of law should support the consideration of the principles of "pollution prevention" and "the pollutor pays" in economic decisions and activities.

105. The reversal of the environmental degradation at national, regional and global levels will only succeed with a gradual shift towards a more socially sustained development. This requires a breakthrough in the concepts of development and international cooperation, and a departure from "business as usual".

106. However, international cooperation cannot replace the political will and concerted action needed to effectively implement the concept of endogenous capacity in science and technology as the decisive prerequisite in the management of technological change towards sustainable development. The potential for environmentally sound technologies to respond effectively to global and local environmental concerns in developing countries will remain limited unless that capacity is built up.

Notes

1/ World Commission on Environment and Development. Our Common Future (Oxford University Press, 1987).

2/ Final Act of the Conference of Plenipotentiaries on the Protocol on Chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone Layer, convened by the United Nations Environment Programme, Montreal, 14-16 September 1987.

3/ D. Jane Pratt, "Funding of the global environment", paper presented at the first session of the Preparatory Committee for the United Nations Conference on Environment and Development, Nairobi, August 1990.

4/ Mohamed T. El-Ashry, "The transition to sustainable development: the United Nations 1992 Conference and beyond", paper presented at the meeting of Senior United Nations Officials for Social and Economic Development, New York, 25 January 1991.

5/ "The costs to developing countries of entering the Montreal Protocol", study presented at informal consultations on financial mechanisms organized by the United Nations Environment Programme (UNEP/OL.Fin.1/Inf.2 of 18 January 1990), p. 43.

6/ Ministerial Declaration of the Second World Climate Conference, Geneva, 29 October-7 November 1990 (A/45/696/Add.1, annex III), p. 2.

Annex

BACKGROUND

1. In addition to the present report of the Secretary-General, the Centre for Science and Technology for Development has prepared a background document entitled "Environmentally sound technology assessment (ESTA)". This exercise responds to the request of the General Assembly in its resolution 44/14 that the Centre, in cooperation with other United Nations bodies, should serve as the focal point for technology assessment within the United Nations system. The document will be distributed to the Intergovernmental Committee at its eleventh session and subsequently will be published as issue 7 of the Advanced Technology Assessment (ATAS) Bulletin.

2. A preliminary outline of the background document was before the United Nations Advisory Committee on Science and Technology for Development at its tenth session in April 1990 and the Task Force on Science and Technology for Development of the United Nations Administrative Committee on Coordination at its eleventh session in May 1990. A revised version was discussed with members of the Intergovernmental Committee, the Bureau of the Advisory Committee and selected experts at a meeting in November 1990. Drafts of the Secretary-General's report and the background document were again considered by the Advisory Committee at its eleventh session in January 1991 and by the Task Force at its twelfth session in February 1991.

3. The Centre requested national science and technology focal points and regional bodies of Member States to provide information on the generation, transfer, assessment, application and management of environmentally sound technologies. Detailed material addressing specific issues and aspects related to the topic and reflecting national experience in varying country situations has been provided by both developing and industrialized countries.

4. Such activities ensure the active participation of the Intergovernmental Committee in preparations for the 1992 United Nations Conference on Environment and Development.

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FINANCING SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

SUMMARY

How the growing scientific and technological needs of development, especially in developing countries may be financed, has been a matter of enduring concern to the Intergovernmental Committee. This subject was considered in the context of the establishment of the long-term, self-sustaining financing system envisaged in the Vienna Programme of Action on Science and Technology for Development, as well as a substantive theme at its session in 1986.

The end-of-decade review on the implementation of the Vienna Programme of Action brought into sharper focus the concept of endogenous capacity building as one of the future areas of concentration. The United Nations Fund for Science and Technology for Development, an integral part of the United Nations Development Programme, has not been able to attract the critical mass of core resources to make it sustainable. There is now a growing recognition of the importance of science-based technologies as critical inputs for accelerated growth and sustainable development. While, on the one hand, the multilateral resource base for endogenous capacity building in science and technology is diffused and, in relative terms, declining, there is, on the other hand, increasing awareness of its criticality. The decision to examine the possibility of organizing a more effective coalition of resources, in response to a new paradigm of development, is a consequence of this.

* A/CN.11/1991/1.

The report discusses the various issues involved in generating domestic resources to support endogenous capacity building in developing countries and examines various modalities such as national budgets, fiscal incentives, macroeconomic policies, financial intermediaries, national funds etc. It makes a brief review of the effectiveness of bilateral aid for science and technology and makes suggestions like setting target percentages of official development assistance to finance research and development in the recipient country. The principal focus of the report however is on multilateral resources and, in this context, it provides a framework for organizing a more effective coalition of resources for capacity building. In doing so, it reviews the experience gained in establishing the long-term financing system as envisaged in the Vienna Programme of Action as point of departure.

The report concludes that, given the increasing importance of financing activities related to endogenous capacity building in science and technology and the plurality of funding mechanisms, organizing a more effective coalition of resources is not only a possibility but a necessity if the concept of endogenous capacity building is to acquire operational credibility. Discussions with other potential participants in the coalition will be held after the Committee considers this paper and provides its guidance. A great deal of thought and work is required to make these ideas concrete and to transform them into a politically acceptable and substantively sound framework.

CONTENTS

	Paragraphs	Page
INTRODUCTION	1 - 5	4
I. PRESENT SITUATION	6 - 11	5
II. MOBILIZATION OF RESOURCES	12 - 48	7
III. NEW FINANCING CONCEPT: COALITION OF RESOURCES	49 - 67	17
Annex. UNITED NATIONS FUND FOR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT: LIST OF PROJECTS AS OF 31 DECEMBER 1990		22

INTRODUCTION

1. The Secretary-General was requested, by General Assembly resolution 44/14 and Intergovernmental Committee for Science and Technology for Development resolution 2 (X), to prepare a comprehensive report on financing science and technology for development and to explore the possibility of organizing a more effective coalition of resources within the United Nations system, multilateral financing institutions, regional development banks and bilateral funding agencies to strengthen the endogenous capacity building of developing countries in science and technology. In response, a combined report has been prepared with a programmatic focus on endogenous capacity building. The report also includes a section on the activities of the United Nations Fund for Science and Technology for Development.

2. Financing development needs in the 1990s is a major issue in the international economic agenda. With an overall insufficiency of capital and many competing demands, policy makers at the national and international levels are finding the task of priority setting and orderly allocation of resources extremely difficult. Although over the past 40 years, sizeable gross flows of about $US 600 billion to $700 billion were funneled from developed into developing countries through public means and over $500 billion through private funds, the real net flows have been estimated to be no more than about 35 per cent of gross amounts from public means. During the past five years, reverse net flows totalling $150 billion in debt service and a further $200 billion by way of capital flight have taken place, aggravating developmental problems. 1/ In 1989 alone, net outflow of resources amounted to $26 billion and, by the end of 1990, the total debt of developing countries amounted to $1,319 billion (A/45/273).

3. Because of the debt crisis, unwillingness of creditors to lend and the inability of debtors to absorb and service more debt, developing countries' external financing dropped from about $160 billion in 1981 to $68 billion in 1986, with the share of net private lending dropping from 57 per cent of the total in 1981 to only 4 per cent in 1986. A consequence of this situation is the greater willingness on the part of developing countries to welcome foreign investment, with attendant relaxation on domestic ownership requirements, more liberal trade and fewer bureaucratic regulations, as well as offering new fiscal incentives. 2/ As private lending has fallen precipitously, official loans and grants have risen from 31 per cent to developing countries' external finance in 1981 to 77 per cent in 1986, although in nominal terms this is only a small absolute increase. In real terms, official development assistance (ODA) to developing countries from industrialized country Governments has declined from $48.1 billion in 1988 to $46.7 billion in 1989 (by 2 per cent). In terms of ODA/GNP ratio, the 1989 figure was 0.33 as compared to 0.36 for 1988. 3/

4. As the International Development Strategy for the Fourth United Nations Development Decade states:

> "A solution to the debt problem, adequate resource flows and a supportive environment in the areas of international trade and commodity markets are among the prerequisites for the reactivation of development during the 1990s. But a sustained acceleration of the development process will not take place unless developing countries modernize and transform their industrial and agricultural sectors and participate in the progress made possible by advances in science and technology."

A prerequisite is the capacity to make informed and autonomous decisions on how and where to target and assimilate technology - imported or domestic - in the development process. Building such capacities, inter alia, needs sustained commitment, supported by specific resources.

5. The concept of endogenous capacity building, as distinct from indigenous development, is discussed in some detail in another document (A/CN.11/1991/4). The growing consensus that even access to and utilization of foreign technology needs a critical mass of domestic capacities needs to be deepened to include financing. The present paper concentrates on the issue of how, in the above setting, the needs of developing countries in science and technology are to be financed, oriented in particular towards endogenous capacity building.

I. PRESENT SITUATION

6. Buffeted and beset with issues of survival, many developing societies, particularly the least developed, find themselves on the horns of a dilemma: how to balance investments to meet immediate short-term needs without compromising important long-term imperatives such as endogenous scientific and technological development.

7. The crucial process of creating and strengthening the endogenous scientific and technological capacities of developing countries has not received the kind of sustained and strategic resource underpinning that could have made a difference to economic growth and development. While some developing countries have, in spite of a serious resource crunch, managed to mobilize significant financial resources for science and technology, many others have been unable to put in place the right policy package. International support to the efforts of developing countries has also remained diffused and disparate.

8. To illustrate, most developing countries have been unable even to mobilize 0.5 per cent of their gross national product towards research and development (not to speak of the quality of such investment), in comparison to over 2.5 per cent in many industrialized countries (Japan and the United States of America, 2.7 per cent and 2.5 per cent, respectively, in 1985). In global terms, the share of developing countries as a whole account for only 6 per cent of R&D expenditures. Transnational corporations, major conduits of modern technologies, have their primary R&D locus in their home countries. United States transnationals expend almost 90 per cent of R&D expenditures at

home, 9 per cent in other industrialized countries and 1 per cent in the developing countries, mostly for quality control and local adaptation. Although research and development is not synonymous with innovation or endogenous scientific and technological capacity per se, it still constitutes an important barometer. Furthermore, it is not often remembered that R&D is but a part, albeit an important part, of science and technology and that attention and resources are also required for other equally crucial elements, such as education, training, design capacity etc.

9. A major weakness and impediment in the early years after 1979 when the United Nations Conference on Science and Technology for Development was held at Vienna, was the lack of sufficient clarity about the evocative but elusive concept of endogenous capacity building in science and technology which, inter alia, led to a situation where even the modest amounts being channelled into science and technology in developing countries did not accelerate their endogenous capability building. Owing to the work of the Committee and decisions taken in recent years, there is now a much better understanding of the concept, in both intergovernmental and intellectual circles. The time is therefore now opportune to address the question of how to finance attendant activities.

10. The subject of financing science and technology has long been a topic of intergovernmental consideration and much work has been done, inter alia, by the intergovernmental Group of Experts on the United Nations Financing System for Science and Technology for Development and the Ad Hoc Group of the Whole. The expert group tackled the difficult issue of "gap" and level of funding required and opined that, based on a 3 per cent rate of growth of GNP, and on the assumption that developing countries would not be able to allocate more than 0.6 per cent of GNP for R&D by 1990, additional funding on the order of $5.4 billion would be needed by 1990 for R&D alone. It can easily be argued that such gross funds covering the developing world as a whole are of little practical use. None the less, they are useful as points of reference in assessing the order of magnitude of resource requirements.

11. This paper briefly analyses the current situation and concentrates on how to enhance and assemble the critical mass of resources necessary, not for science and technology at large, but for those activities that come within the foci of endogenous capacity building. In doing so, it is important to note that endogenous capacity building through science and technology has, indeed, as much, if not more, to do with policy-making, priority-setting, entrepreneurship and management as with science and/or technology per se. After all, endogenous capacity can be equated with the capacity to manage technological change.

II. MOBILIZATION OF RESOURCES

12. Excluding mechanisms such as the impact of market and taxation mechanisms on financing science and technology, as well as other incentives necessary to create a favourable climate for investing in science and technology, in particular research and development, this exercise primarily focuses on the mobilization of financial resources for the direct allocation of activities and programmes related to promote science and technology. Basically the paper deals with financing of science and technology from three intertwined angles: private and public, domestic and external, bilateral and multilateral with regard to the external financing.

Domestic resources

13. Developing countries as a whole have generated internally some 80 per cent of the total resources devoted to investment in general, the balance emanating from foreign aid and direct foreign investment. Note however should be taken that many of the smaller and least developed countries depend to a significantly larger extent on external resources for purposes of investment. In terms of GNP, aid constitutes a much smaller figure, amounting, on a net basis, for some countries to even less than 1 per cent. The burden that developing countries bear in financing their scientific and technological endeavours from their domestic resources is even higher, amounting to about 90 per cent of the investments.

Macroeconomic policies

14. A major problem that many countries face is the lack of a strong and sustained societal, particularly political and administrative, commitment along with an inability to reconcile macroeconomic management with technological development. Major economic, financial, taxation and regulatory policies in many countries act, perhaps unwittingly, as a deterrent to technical change and innovation. A major study of the Organisation for Economic Co-operation and Development (OECD), entitled Technical Change and Economic Policies (1980), showed how such policies act to shape the directions of technological change in either positive or negative ways. In some countries, while State-funded research laboratories develop processes for domestic production, customs and other laws allow free imports on one hand and local taxes are levied on domestic products. If developing countries are to succeed in their efforts to harness technology towards development, they should remove basic structural and policy impediments.

Science and technology policies

15. Science and technology policies, even in those countries where they are coherent, have largely remained as isolated adjuncts to socio-economic policies, leading at once to complacency and ineffectiveness. Experience has shown that mere formulation of science and technology policies does not ensure either the adequacy or the direction of science and technology efforts to raise productivity or to improve living standards. They need to be closely

dovetailed with economic policies and development plans. In their formulation and implementation, it is necessary to involve the widest possible stakeholders in the society.

16. Another important factor is that the State and the Government have been mobilizing almost 60 to 99 per cent of the funds. In contrast, the share of national R&D expenditures financed by the Government of Japan was only 22.2 per cent in 1983 and 46 per cent (including a large component of military R&D) in the United States. Of the estimated $108 billion that the United States is expected to spend this year on civilian R&D, the share of industry could be about $74 billion.

17. Although many developing countries have taken steps in recent years to increase the participation of the non-governmental sector, the share of the State still remains by far the preponderant portion. This is largely due to the nature of the economic structures in these countries, State control of large segments of the productive systems, inability or unwillingness of the private sector to invest in long-term and inherently risky ventures such as research and development and the overall absence of entrepreneurial risk-taking.

National budgets

18. Most scientific and technological activities in developing countries are undertaken by institutions belonging to the State sector and are therefore financed in the main by national budget. At the same time, the budgets lack transparency, and it is seldom possible to identify in the budget the totality of resources allocated to science and technology and the purposes for which these are utilized and, most of all, how they relate to national developmental objectives.

19. Being annual in nature, national budgets also are not suitable to science and technology projects and, in particular, those which are inherently long-term in their nature such as the endogenous capacity-building type of activities. Although the idea of a consolidated, single budget line devoted exclusively to science and technology has long been considered, most countries have not been able to introduce it. The time has come to consider if such a consolidated budgetary provision could be introduced for endogenous type of scientific and technological activities and not for all science and technology activities. This will facilitate greater transparency and mobilize budgetary resources towards endogenous capacity building as a manifestation of long-term commitment. But implementing it in practice would require the development of criteria and guidelines yet to emerge.

National funds

20. Many Governments have set up modalities such as consolidated national funds for science and technology, sectoral funds, functional or special purpose funds. These are designed to introduce a measure of continuity in funding and autonomy in operation. The means through which such funds are

financed vary from country to country, such as levels of specific taxes or cesses, either in an across-the-board or selective basis.

Financial intermediaries

21. In recent years, developing countries have come to acknowledge the fact that an entrepreneur that takes the inherent risks of innovation requires a far different kind of support than has been traditionally forthcoming. As a result, some of them have established financial intermediaries and venture capital funds that exist in those few countries that have sophisticated financial systems like Argentina, Brazil, India, Mexico, the Republic of Korea etc. The function of financial intermediaries such as national research development corporations is to act as a bridge between R&D institutions, end-users, financial institutions and design, engineering and consultancy firms. They function as conduits to provide risk finance for entrepreneurs by combining indigenous R&D with investment capital. Their performance has varied from country to country.

22. While there are those who argue that there is no additionality, many consider that a carefully calibrated package of incentives could make a difference when the risks are high and returns uncertain. Incentives include tax rebates, tax credits, tax holidays, customs exemptions etc. Since the public good is larger than private gain in R&D, and society stands more to benefit from the fruits of research than the researcher, many countries, including industrialized countries like the United States, have been offering incentives to support corporate R&D. Each developing country would need to design their own package in tune with their own needs and circumstances. They have to be selective, targeted and demand driven. The question is not "if" but "what" in order to allow the private sector to play a pivotal part in the process of providing endogenous capacities, particularly R&D.

23. In sum, while many developing countries acknowledge the indispensable role of science and technology as tools of accelerated growth and development, most have been unable to integrate the concept of endogenous capacity building into the very fabric of policy-making, programming and project formulation, encompassing not only the State but society as a whole; or to recognize that the subject of financing science and technology should not be seen as an exercise in the allocation of public funds but as an organized societal process of harnessing resources from all the stakeholders in the development process. This is especially relevant since the definition of the amount and kind of external resource support should evolve from the stakeholders' dialogue.

External aid

24. The place of external aid in development has been the subject of new thinking in recent years. No longer is it considered simply as a "gap-filling" activity. It is now generally considered that it triggers a multiplier effect, adds flexibility and, if properly targetted, could help stimulate stagnant economies. In science and technology in particular, aid

could help in obtaining access to advanced technologies and contribute to endogenous capacity building.

25. It has always been difficult to assess the volume of financial resources for science and technology for development by external donor agencies. One study, quoted by the Advisory Committee on Science and Technology for Development, in their report on their eighth session in 1988, estimated that the likely flow of financial support to science and technology - or more exactly, to research and development - in developing countries in 1984, was $2.4 billion, with more than half being directed to agriculture and rural development.

Bilateral resources

26. Bilateral aid has been the main component of ODA. In 1980, DAC (Development Assistance Committee of OECD) bilateral ODA amounted to about $18 billion. It increased in nominal terms to $30 billion in 1985 and $37 billion in 1986. The 1980s also saw a distinct preference towards bilateral ODA and in 1986, $27 billion out of $37 billion were channelled bilaterally by DAC countries. In 1989, out of $46.7 billion, $34.2 billion were bilateral. As a percentage of GNP, 0.24 per cent out of 0.33 per cent of DAC ODA in 1989 was accounted for by bilateral channels. 3/ Furthermore, bilateral aid of most donor countries is also focused on a few countries, consistent largely with perceived strategic considerations or historical connections.

27. It is in this setting - and the reversal in the debt-related transfers and decline in other private financial flows - that the issue of bilateral aid for science and technology needs to be reviewed. Science and technology, particularly research and development, have been a component of bilateral aid from DAC countries for over three decades. Other components are scientific and technical education and training and scientific and technological services. University exchanges are also an important part of scientific and technological cooperation with development countries. Scientific and technological forms of cooperation for development provided by OECD countries is essentially of two types:

(a) Those intended to help developing countries increase their research activities and institutions that allow these activities to be focused towards meeting urgent socio-economic problems;

(b) Those intended to bring part of the research potential of the industrialized societies to bear on programmes and projects designed to solve the crucial technical problems of developing countries which they themselves are not in a position to solve for the time being.

From a sectoral point of view, highest priority for R&D expenditures for development is given to agriculture and food; medicine and public health have second priority, followed closely by natural resources or energy.

28. The modalities for channelling bilateral aid for science and technology vary from country to country. Some of them have created specific publicly-funded autonomous institutions such as the Swedish Agency for Research Cooperation with Developing Countries (SAREC) of Sweden, the International Development Research Centre (IDRC) of Canada, the Australian Centre for International Agricultural Research (ACIAR), the Research and Evaluation Division of the Norwegian Agency for International Development (NORAD) etc. Some others like the United States Agency for International Development (AID) have, through the creation of a new post of Senior Assistant Administrator for Science and Technology and an Office of the Science Adviser, sought to energize support for science and technology. Other countries, such as Japan and the United Kingdom, rely on decentralized structures and on existing aid mechanisms.

29. In the early 1980s, the contribution of DAC countries to R&D activities for developing countries according to OECD, expressed by using purchasing power parities, totalled about $700 million, corresponding to about 0.4 per cent of the gross domestic expenditure on R&D of all OECD countries. Such an expenditure is estimated to correspond to about 2 per cent of ODA. The estimated amount for science and technology as a whole for developing countries was about $1.8 billion. 4/

30. Since science and technology pervade most areas of bilateral aid, it is difficult to segregate scientific and technological aid separately from ODA. An attempt should however be made to define the processes by which science and technology aid could contribute to the ultimate targets of development and increase the extent to which local scientists and institutions are associated with science and technology research work that is supported by bilateral aid. Direct links between specific developed country and developing country institutions, including training, could greatly enhance the effectiveness of bilateral aid. Aid-funded research in developing countries should use local resources and local personnel, encourage local development of technology appropriate to local conditions and become more demand driven. Greater attention should also be given to "software" aspects, such as maintenance and modernization. A shift away from "science push" of R&D towards demand "pull" of industry could contribute to the process of capacity building. As recommended by the South Commission, a link should be established between total international aid and aid for science and technology. One way might be for donor countries to agree to provide a fixed percentage of their ODA as an additional sum to finance R&D activities in the recipient country.

31. It is clear that, without the full cooperation of the bilateral donors, the goal of mobilizing the critical mass or a coalition of resources for financing science and technology, and especially for endogenous capacity building, cannot be reached.

Multilateral resources

32. Multilateral development financing, primarily a phenomenon of the last four decades, has increasingly come to play a prominent place in the endeavours of developing countries to accelerate their pace of economic growth and development. Although dwarfed by private flows to developing countries and bilateral aid, multilateral financing, particularly of the concessionary type, have become irreplaceable in the development context. They are generally acknowledged to be more catalytic, strategic, non-conditional and more responsive to national priorities. Furthermore, multilateral resources, properly used, add flexibility and adaptability to otherwise rigid and inflexible economies. Their universality touches far more countries than bilateral aid.

33. Multilateral development financing in terms of percentages, accounted for under 9 per cent of total developing country receipts in 1970, rose to 13 per cent in 1980 and to over 20 per cent in 1985 (A/45/273). Multilateral ODA has now reached an annual level of $12.5 billion, about one third of which is in the form of technical cooperation. 3/

The World Bank

34. Disbursements from the World Bank grew dramatically from about $500 million in 1970 to over $7.5 billion in 1983 and to over $10 billion in 1986. Net transfers, however, have tapered off from a peak of just under $6 billion in 1984 to about $3 billion in 1986/87. Between 1970 and 1983, net disbursements of the three major regional development banks, Asian, African and Latin American, grew from $300 million to about $2.5 billion. Since 1983, growth in almost all sources of multilateral financing has leveled off or declined substantially, especially in net resource transfer terms. What is sometimes termed as "aid fatigue" particularly pertains to multilateral concessional resources. 1/

35. It is important to bear in mind the broad multilateral development finance setting in considering aid for science and technology. Aid for science and technology pervades most of multilateral aid, albeit, in a largely implicit manner. From 1975 to 1984, the World Bank lent about $2 billion to the Governments of developing countries to help them to reorganize and recoup their national agricultural research and extension systems, about $1 billion for scientific and technological education, $1.4 billion for project-related training and $118 million to promote innovation in industrial enterprises, including provision of venture capital. The Bank has several unique advantages for its work in science and technology. As a major multilateral financial institution, the Bank can mobilize resources in the capital markets and apply them to development on the basis of demand for financing viable projects. In addition, it has influence and an overview of the problems of development. It can help build local technological capacity as a component of major investment projects. It can finance a scaling up of successful innovations and it can plan and fund large-scale research on critical global problems. It can facilitate interfacing of science and technology policies

with macroeconomic management. It can influence national policies to encourage research, innovation and more appropriate choice of technology in a manner that is directly contributory to endogenous capacity building.

36. The time is now opportune, given the range and pace of technological change and its impact on development, for the Bank to consider, as a core element of its policies, supporting the efforts of developing countries to enhance their endogenous capacity. The Bank could, for instance, consider introducing the concept of endogenous capacity building into the structural adjustment programmes, and support ECB efforts through concessional financing and technical assistance. The Bank should also consider lending more for research, development and pilot tests and provide grants to research on issues of broad potential relevance to development. A not too close parallel is the Bank's role in setting up the Consultative Committee on International and Agricultural Research (CGIAR). The Bank should strengthen its in-house capabilities so as to build into its decision-making apparatus an element of concern about science and technology. The Bank could also consider injecting the dimension of technological appropriateness into the project cycle, starting from conception, to formulation, to execution, to monitoring, to evaluation, on the lines of its recent effort in regard to environment. The Bank's first annual report on "The World Bank and Environment" is an instructive example of what can be done for science and technology if there is similar support.

37. A commitment on the part of the Bank and allocation of commensurate resources is unlikely unless Member States themselves advocate the cause of science and technology in the governing organs of the Bank.

Regional development banks

38. Regional development banks, particularly the three main regionals, namely, the African, Asian and Inter-American Development Banks, are expected to play a strong role in development finance in the 1990s. These banks have grown significantly in their financial capacity and account for a larger volume of net non-concessional transfers than the World Bank at present, though their combined concessional transfers are about half the level of IDAs ($1.5 billion). In addition to the three, there are also smaller subregional institutions such as the Caribbean, South Pacific and Islamic Development Banks. Together, they constitute significant sources of funding for developing countries, and the issue of their role in science and technology and in strengthening endogenous capacities of developing countries needs to be considered.

39. The regional development banks, with perhaps the exception of the Inter-American Development Bank, have been, in the past, somewhat reluctant to directly support science and technology, as their loan portfolios indicate. Other regional development banks such as the Asian Development Bank and the African Development Bank have also, in recent years, come to pay greater attention to science and technology and are supportive of the efforts of developing countries in this respect. Gradually, most development banks are

grasping the fact that they play a key role in technology choice and transfer. Much remains to be done, particularly in injecting the dimension of technological appropriateness and endogenous capacity building as an integral element in the project cycle so that decision makers become aware of the full societal implications of technology funded by these banks. This is why it is so important that the banks give direct support to ECB efforts in developing countries.

40. It is thus necessary to introduce technological advocacy in their decision-making process and one way of ensuring that is to have a distinct organizational focus in their secretariats. These banks should also consider allocating a certain portion of their concessional resources for the direct support of endogenous capacity building in science and technology in their member countries. The representatives of developing countries in the governing organs of these banks should take the lead, demonstrating that they attach high priority for science and technology and that they are prepared to make appropriate adjustments in the allocation of resources.

Resources from the United Nations system

41. The United Nations system, excluding the World Bank and including organizations such as the United Nations Children's Fund (UNICEF), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Development Programme (UNDP), the United Nations Population Fund (UNFPA), the International Labour Organisation (ILO), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), the United Nations Industrial Development Organization (UNIDO) etc. play a large and crucial role in their respective sectors of specialization in channelling and disbursing external financial resources for development. Multilateral funds available to developing countries through the United Nations system, exclusive of the World Bank group, amount to barely one half (an estimated $1.7 billion per year) of technical cooperation funding. Of these, UNDP accounts for about $900 million annually. While these resources comprise a mere 2 per cent of the total ODA, they nevertheless represent a major share of the funds available for United Nations system technical cooperation activities.

42. Specialized agencies such as UNESCO, ILO and FAO finance their scientific and technological activities from their regular budgets as well as through extrabudgetary resources provided by organizations like UNDP, UNFPA etc. They also support science and technology through trust funds made available by donor countries. How much the United Nation system as a whole spends on science and technology in developing countries, and with what effect, has been a topic of long-standing study in the United Nations.

43. Largely due to the difficulty to decide what to include and what to exclude and the pervasive scope of science and technology, it has been difficult to quantify the totality of resources. Inter-agency missions to selected developing countries (Jordan, Nepal, Thailand) attempted to quantify the amounts spent by the United Nations system in those countries but faced

similar problems. It was found to be very difficult to collate such disparate activities and, since the impact of agencies' activities are measured in terms of project objectives, it was not possible to assess ex post facto their contribution to technological development. The latest attempt in this respect, namely, the Cross-Organizational Review of the Medium-Term Plans and Programme Analysis in Science and Technology for Development of 1987, tried to get around the problem by differentiating science and technology activities into core and programme activities. Core activities were defined as those entirely and directly related to science and technology for development, and component activities as those only partially related.

44. It was estimated that during the years 1984-1985 approximately 35 per cent of subprogrammes that address the issue of science and technology for development were core activities. A total of 1,225 technical cooperation projects were reported in 110 countries, of which around 61 per cent were reported as core. Four hundred and seventy-six technical cooperation projects were reported as having the component of science and technology for development. The United Nations, notably the regional commissions, reported the largest number, 41 core activities, with a total cost of some $21 million. Most specialized agencies reported core programmes (112 in all) with a total cost of $337 million. UNESCO reported the largest number among agencies (22 per cent) and WHO the most resources (36 per cent). Among other agencies, more than half of ILO's subprogrammes and most of WIPO's were considered as core. The majority of its activities (288 subprogrammes) analysed were components of subprogrammes directed towards other development objectives.

45. The multitude of figures underscores how complex it is to draw inferences on the impact of science and technology activities - implicit and explicit - on economic development. It underlines the need to introduce a narrower frame of reference, such as endogenous capacity building. An earlier study, namely, the "efficiency study", prepared for the consideration of the General Assembly at its thirty-sixth session, attempted this task and came to the conclusion that, out of a total United Nations official development assistance of $2.2 billion, excluding the World Bank, the resources committed to endogenous capacity in science and technology were on the order of 8 to 10 per cent only.

46. UNDP estimates that roughly 20 per cent of its technical assistance goes towards support of science and technology. Most of it is subsumed in sectoral development, and it is difficult to make any impact assessment. Considering that the bulk of the technical cooperation activities in the United Nations system are funded by UNDP, and since a separate financing system for science and technology has not materialized, it is important that the resources of UNDP play a larger and more direct role in financing science and technology, particularly in support of endogenous capacity building. An analogy could be its work in regard to the formulation of environmental guidelines which were considered by the Governing Council of UNDP at its thirty-seventh session in June 1990. UNDP has included in the checklist of project appraisal subjects like impact on environment, integration of women in development, technical cooperation among developing countries etc., but not impact of technology on development. Such a step, if introduced, could go a long way towards

integrating technological variables into sectoral development and ensuring that the extrabudgetary resources that countries contribute to UNDP as the central funding mechanism, will contribute, if properly targeted, to technological development.

47. The United Nations system at large has not been successful in attracting the necessary resources for science and technology, as anticipated at the Vienna Conference in 1979. Whether this was due to general donor fatigue or to conceptual difficulties in separating science and technology activities convincingly from sectoral development activities is still open to discussion. The fact remains that significant resources mobilization never materialized. The first victim of this situation has been the United Nations Financing System for Science and Technology for Development. This funding entity was one of the four institutions created by the Vienna Conference. After a very successful first year in terms of financial contributions, the Financing System never again received sufficient funds which would have been commensurate with its task as the central funding body in science and technology in the United Nations system; it was terminated as of 31 December 1986 and its responsibilities were transferred to the United Nations Fund for Science and Technology for Development (UNFSTD) which, by General Assembly resolution 41/183 of 8 December 1986, was placed within UNDP. This integration within UNDP was expected to provide a more secure setting for the Fund but at the same time it gave a clear signal to the donor community that a significant growth in core contributions could not be expected. The history of the Fund has so far proven that the small funds within UNDP are not very attractive as far as core contributions are concerned while there is a much wider potential for non-core contributions, i.e. cost-sharing and trust-fund arrangements. Indeed the Fund has been quite successful in obtaining co-financing from countries such as France, Germany,* Italy, Japan and Norway. An analysis of programmes and projects funded makes it clear that the interest of those donors has not been so much the securing of markets for their own services and equipment, as for the desire to participate in a specific science and technology theme, rather than in science and technology per se. Technology information and information technology (including computer technology) covered the largest area of support, followed by science and technology policies, remote sensing and maintenance of scientific instruments. While some of the donors considered the possible feedback for their own markets - although a formal link is ruled out according to UNDP rules and regulations - other donors explicitly excluded interest in such a link. Three lessons can be drawn from this experience for future funding mechanisms and the Fund's role in them:

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* Through accession of the German Democratic Republic to the Federal Republic of Germany with effect from 3 October 1990, the two German States have united to form one sovereign State. As from the date of unification, the Federal Republic of Germany acts in the United Nations under the designation of "Germany".

(a) Countries that are reluctant to make core contributions to small funds either because of reasons of principle or for pragmatic considerations are clearly more easily inclined to consider non-core contributions;

(b) Experience does not necessarily support the often stated observation that non-core contributions are more interested and less neutral;

(c) Donors often prefer specific programmes and projects to non-specific contributions; this is a strong incentive for them to support non-core activities.

48. The annex to this document provides brief information on the activities of the Fund.

III. NEW FINANCING CONCEPT: COALITION OF RESOURCES

49. Experience gained over the past decade in mobilizing financial resources for scientific and technological activities has reinforced the need to preserve plurality. The extant multilateral financing institutions have obviously to play a stronger but targeted role in the future. That, however, is not sufficient to impart sufficient momentum to the painstaking process of endogenous capacity building. That requires specificity and distinctiveness. Before attempting to delineate the contours of the concept, it is important to draw the right lessons from the abortive efforts to create a long-term, self-sustaining, off-the-shelf financing system for science and technology for development as envisaged in the Vienna Programme of Action.

50. These can be summarized as follows:

(a) Support has to be universal, inclusive of all the major donor countries. Though some of the donor countries might be sympathetic to the objectives, they remain reluctant to commit resources in the absence of balanced burden sharing within the donor community itself;

(b) Resources that developing countries themselves could mobilize, tantamount to a political statement, cannot reach the "critical mass" level;

(c) It is difficult to interest many countries in pledging resources to something as generic as science and technology. A more clearly defined programmatic focus is necessary to provide the confidence and credibility that the resources would be utilized for realistic and concrete objectives;

(d) It is important to establish a clear conceptual and operational differentiation between the activities to be supported by any new modality and those that have been traditionally supported by well-established funding bodies such as UNDP;

(e) In the prevailing political and economic environment, it is not possible to replicate modalities such as IDA of the World Bank or the

International Fund for Agricultural Development (IFAD); contributions to any new mechanisms can only be wholly voluntary in nature;

(f) The architecture of any new arrangement should avoid creating a new and large bureaucracy to manage meagre resources.

51. It is essential to avoid the above pitfalls in the design and frame of any new modality for financing science and technology. The following considerations should be borne in mind in any new paradigm:

(a) The programmatic focus should be endogenous capacity building of developing countries in science and technology based on commonly accepted and clearly defined criteria. That such a focus is likely to be attractive to the donor community is evidenced by the fact that some of the major donor countries, such as Germany, Japan and Switzerland, have supported the pilot projects on endogenous capacity building in selected developing countries through trust funds during the past two or three years;

(b) Many donor countries are currently engaged in supporting science and technology in developing countries and, implicitly, endogenous capacity building, with very little coordination among themselves, creating vertical - and not always healthy - linkages between the donor organizations and institutions and organizations in the developing countries. Little, if any, horizontal coordination takes place either among the donor countries or the recipient institutions in the developing countries. As noted by the Expert Meeting on the Role of Science and Technology in Development Cooperation with the Less Advanced Developing Countries in the 1990s, "a strategic capacity building approach requires much more effective coordination between aid agencies in the field" (DCD/DAC(90)39). 5/

52. The intellectual challenge would be to design a flexible and pragmatic structure with a clear programmatic focus that draws upon a coalition of domestic and external resources from interested donor countries and institutions.

53. A major point of departure for the coalition would be that it included domestic resources. There is a growing feeling that organic integration of domestic and external resources in support of concrete programmes is mutually beneficial and will optimize scarce resources. Strict separation has often led to underutilization, waste and to a flow of external resources in support of activities that are demonstrably not of highest priority. It also takes into account the fact that external financing often is donor driven. Given the dynamics of domestic funding and external aid, this is a difficult task and has to be carefully thought through. One way could be to provide that the resources from such a coalition would be made available only to those countries that provided resources to a certain percentage, perhaps 25 per cent (except least developed countries who might be required to make a token contribution). The resources made available by the concerned countries could be integrated at the country level and earmarked to specific projects by the round tables chaired by the United Nations resident coordinator/resident

representative. Project proposals submitted for support from the coalition would be cleared by the round table with a clear indication of the domestic component. The precise modalities would need to be carefully worked out if there was agreement in principle.

54. The most important feature of such an approach is the process that precedes the interaction with the coalition of resources. This is the stakeholders' dialogue process which achieves a consensus about future priorities and initiatives in science and technology for development. The stakeholders should include those constituencies in society that would be mostly affected by technological change.

55. Another feature would relate to the nature of projects to be funded. A large part of external aid has hitherto been oriented towards the financing of infrastructure, physical facilities, plant and machinery, i.e. hardware, to the relative neglect of investment in human capital, training and skills to operate, maintain and adapt technology. It is to these "software" aspects that the funds would be targeted in the context of endogenous capacity building.

56. The organized coalition of resources could function at two levels: global and national. At the global level, it could take the institutional form of an informal association of like-minded donors, bilateral as well as multilateral, including the World Bank, UNDP, regional development banks and international foundations and major bilateral donor organizations such as SAREC, IDRC etc. The association would meet once a year: (a) to mobilize and collate resources; (b) to allocate resources to specific projects submitted by developing countries; and (c) to monitor the progress and execution of projects.

57. A small executive board of seven members (from donors and from the recipient countries) would meet twice a year to oversee the work of the association. The secretariat would be provided jointly by the Centre for Science and Technology for Development and the United Nations Fund for Science and Technology for Development.

58. The resources of the association would be strictly utilized to fund, not generic science and technology activities, but those that were demonstrably designed to build endogenous capacities of developing countries in science and technology based on specific criteria to be approved by the executive board and the association.

59. Projects would be financed either through a single contributory source or a combination of sources. Financial support would be provided in the form of grants or soft loans for the duration of a project. Aid could take the form of co-financing or joint financing.

60. A major activity of the coalition would be to finance the portfolio of prioritized activities that arose out of the endogenous capacity building pilot projects through dialogues among the stakeholders in the development

process. Such a process would help to identify the priority needs in a country and to better understand the role of science and technology in responding to the development needs as well as contribute to a more effective use of external assistance as a supplement to domestic efforts.

61. At the national level, the present modality of a round table of the donor community would be used and extended to the project. It would scrutinize the proposals submitted by the concerned countries to ensure that those projects conformed to the guidelines relating to their character as endogenous capacity building types of activities. The precise functions of the round table would need to be more clearly detailed.

62. An organized coalition of resources of this nature would ensure that the resources of the donor community, balanced and supplemented each other and were channelled specifically towards activities truly directed towards endogenous capacity building. Such a mechanism would not in any way duplicate or replace any of the existing funding bodies in or outside the United Nations system and the resource requirements would also be rather modest, since activities would not be expected to be capital-intensive, requiring the purchase of costly equipment or the setting up of large research laboratories and facilities.

63. At any rate, it wold be crucial that the interactions with the coalition of resources were preceded by the participatory decision-making process of the stakeholders' dialogue type. Otherwise, the shift from donor-driven to country-driven development assistance would be delayed.

64. The concept of a coalition and the way in which resources would be used also responds to often repeated criticisms about aid; that project aid is biased towards capital and foreign exchange expenditures to the neglect of operating, recurrent and local costs; that annual budgetary allocations do not provide the continuity that is needed; that aid is dissipated due to lack of coordination among different donors; that donors are often interested in direct and visible outputs at the expense of long-term sustained development.

65. The above outline presents an innovative, flexible and pragmatic modality designed to respond at once to the current financial realities and the growing substantive need. The emphasis is on "qualitative addition", not on any large "quantitative increase" in the total aid. It would enhance the developmental quality of existing aid. Much remains to be done to elaborate on the details and to plug many loopholes that might surface on closer scrutiny. After the Committee gives its consideration to the concept/framework, the Centre, in close cooperation with the United Nations Fund for Science and Technology for Development, would try to prepare a more comprehensive blueprint with the help of experts drawn from within and outside the United Nations system. A meeting of interested donors would be called to seek their views and suggestions before proceeding any further. Consultations with United Nations funding bodies, such as the World Bank and UNDP, have not been held since it was felt premature to do so, bearing in mind the fact that what the Committee requested,

at this juncture, is an examination of the possibility of a more effective organizational coalition of resources.

66. It is important however to note that at the OECD Expert Meeting on the Role of Science and Technology in Development Cooperation with the Less Advanced Developing Countries in the 1990s (May 1990), the need for closer aid coordination was emphasized. Inter alia, the report noted that aid agencies should increasingly shift from a project-by-project approach to a more strategic capacity building thrust, and that such an approach required much more effective coordination between aid agencies in the field. 5/

67. In sum, no single source - bilateral or multilateral - can fill the existing void and, given the reality of diminishing resources, only through a pooling of funds from like-minded donors can a critical mass of resources be mobilized. An organized coalition of resources is necessary to meet the challenge of stimulating endogenous capacities in science and technology in developing countries. Such a coalition will also be in line with the conclusion in the OECD report noted above that the full integration of science and technology into the development process through the building of national capacities and coordinating domestic and international efforts through a set of key development missions is a major exciting task for the 1990s. 5/

Notes

1/ Percy S. Mistry, "Financing in the 1990s" in Co-operation for International Development, Robert J. Berg and David F. Gordon, eds. (London, Lynne Rienner, 1989).

2/ Linda C. Lim, "World economy" in Berg and Gordon, op. cit.

3/ Organisation for Economic Cooperation and Development, Development Co-operation: 1990 Report (Paris, 1990).

4/ Organisation for Economic Cooperation and Development, Scientific and Technological Co-operation with Developing Countries (Paris, 1985).

5/ Report of the Expert Meeting on the Role of Science and Technology in Development Cooperation with the Less Advanced Developing Countries in the 1990s, sponsored by DAC/OECD, May 1990. Unpublished paper.

Annex

UNITED NATIONS FUND FOR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT: LIST OF PROJECTS AS OF 31 DECEMBER 1990

A. Ongoing

Africa

BDI/85/T01	Transfert et développement de technologie
IVC/81/T01	Haemostasis in Black Africans
MAG/89/E01	Mini-Hydro Power Plant in Adriantsemboka
RAF/81/T02	Lagos Plan of Action in Science and Technology
RAF/86/T01	International Consulting Consortium in Africa (ICCA)
RAF/87/T01	Field Testing and Research on ENDOD
RAF/88/T02	Maintenance of Scientific Equipment in the SADCC Countries
RAF/88/T03	Promotion of Small Tech-related Enterprises
RAF/90/T02	Biotechnology for Food Production
ZAM/87/T01	Industrial Application of Biotechnology
TOG/89/T01	Technology Incubation Centre

Asia

CPR/84/T01	Beijing National Food Technology Institute
CPR/84/T02	Computer-based Management Training Programme
CPR/87/T01	Drip Irrigation Technology
CPR/89/T01	Beijing International Conference on Technology Innovation
IND/89/T01	Technology Incubation Centre
INS/83/T01	Appropriate Technology for Rural Communities Phase II
MDV/82/T01	National Planning Capabilities in Science and Technology
PAK/80/T01	Development Centre for Silicon Technology
PHI/88/T01	Technological Business Incubator
RAS/85/T01	Strengthening Computer Faculty at AIT
RAS/90/T01	Management of Technology at AIT
THA/89/T01	Technology Incubation Centre

Latin America

COS/83/T01	Geothermal Resources
DOM/85/E01	Desarrollo Hidro-eléctrico del Río Ocoa
RLA/84/T01	Regional Non-Destructive Testing Network
RLA/89/T01	Inter-American Space Science and Technology Cooperation
URU/81/T01	Virus de Fiebre Aftosa en Carne
TRI/90/T01	Congress on the Iron and Steel Industry

Arab and Europe

POL/89/T01	Technology Incubator Centre
SUD/89/T01	CD-ROM Services
TUR/90/T01	Establishment of Technoparks in Turkey
YEM/84/T01	Establishment of an Oceanographic Institute
YEM/89/E01	Power System Loss Reduction Study

Interregional

INT/85/E03	International Training Programme in Coal Technology
INT/87/E02	Executive Level Seminar in Coal Technology
INT/89/T02	Endogenous Capacity in Science and Technology
INT/90/T01	Technology Rights Bank
INT/90/T02	Creative Funding for Environmentally Sound Technologies
INT/88/709	Technological Innovation and Entrepreneurship
INT/88/717	PANS on Selected New and Emerging Technologies
INT/88/706	Information System Guide for UNDP Field Offices

B. Pipeline projects

BHU/90/E01	Minihydro Power Station
CHI/90/T01	Technology Park at the University of Santiago
GRN/90/E01	OLADE - Solar Water Heaters
CUB/91/T01	Pilot Plant for Production of Silicon from Silica
IND/90/E01	Workshop on Renewable Energy
MEX/90/T01	Need Assessment for the Technology Park of Morelos
MON/91/T01	Data Bank for National Mineral Resources
PAK/90/T01	Science and Technology Seminar

PHI/90/T01	Science and Technology Referral Services for Journalists
RAF/87/T02	African Chairs of Technology
RAS/89/T01	Regional Software Centre at AIT
ROK/90/T01	Technology Incubator
STL/91/T01	National Workshop on Science and Technology
SUD/90/E01	Rural Energy Development
TUN/90/T01	National Technology Fund
UGA/90/E01	Geothermal Energy
YEM/90/T01	Volcanological Studies